Fig. 1a

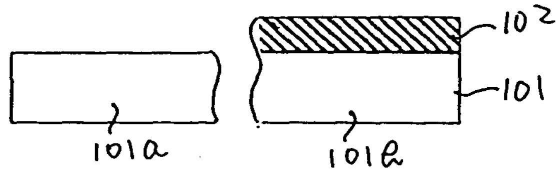


Fig. 1b

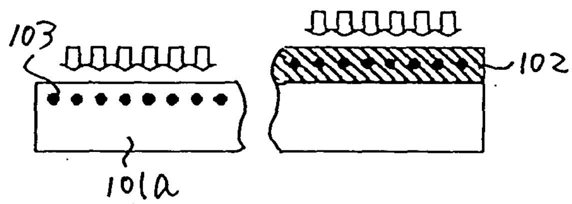


Fig. 1c

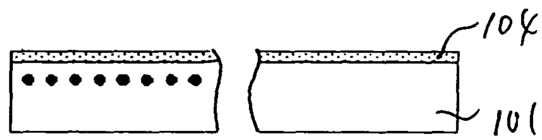


Fig. 1d

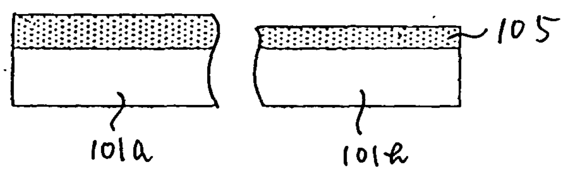


Fig. 1e

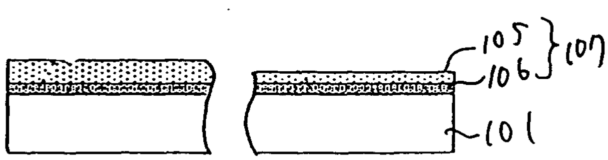


Fig. 2a

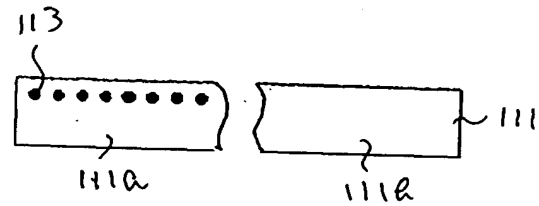


Fig. 2b

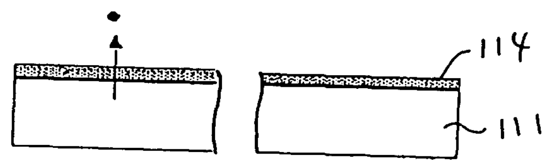


Fig. 2c

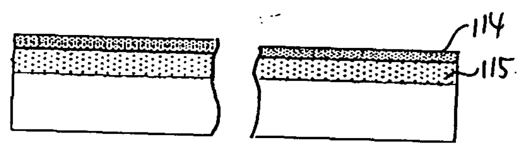


Fig. 3a

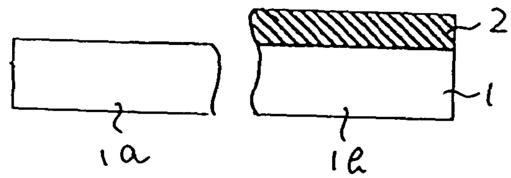


Fig. 3b

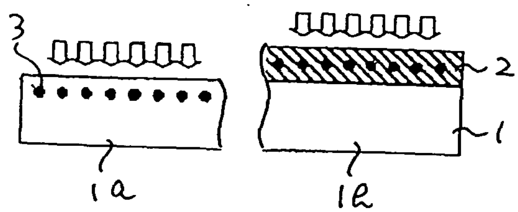


Fig. 3c

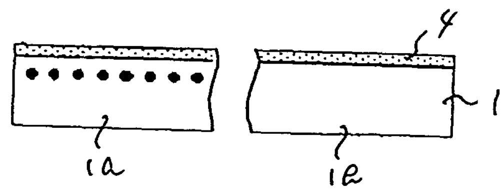


Fig. 3d

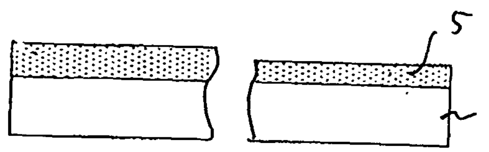
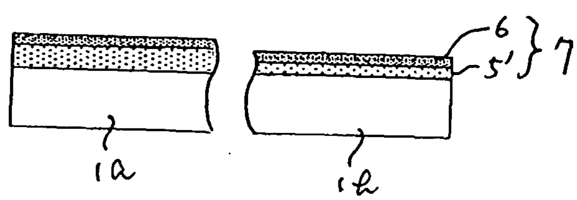


Fig. 3e



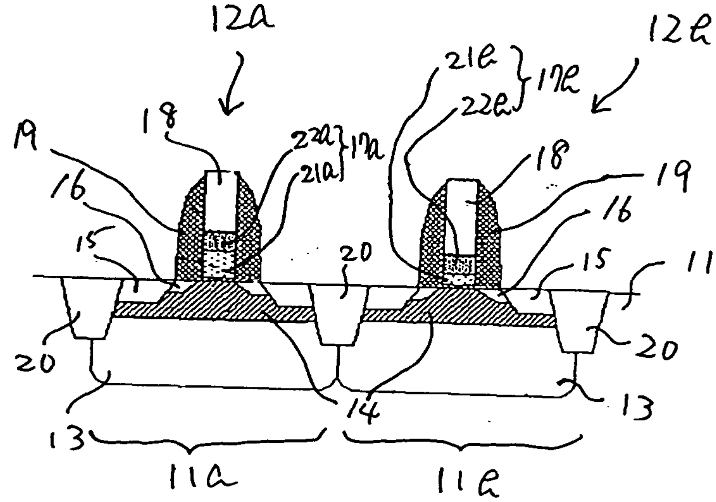

12a
12e
21e
22e
17e
18
22a
21a
17a
19
16
15
20
11
13
14
11a
11e

Fig. 4

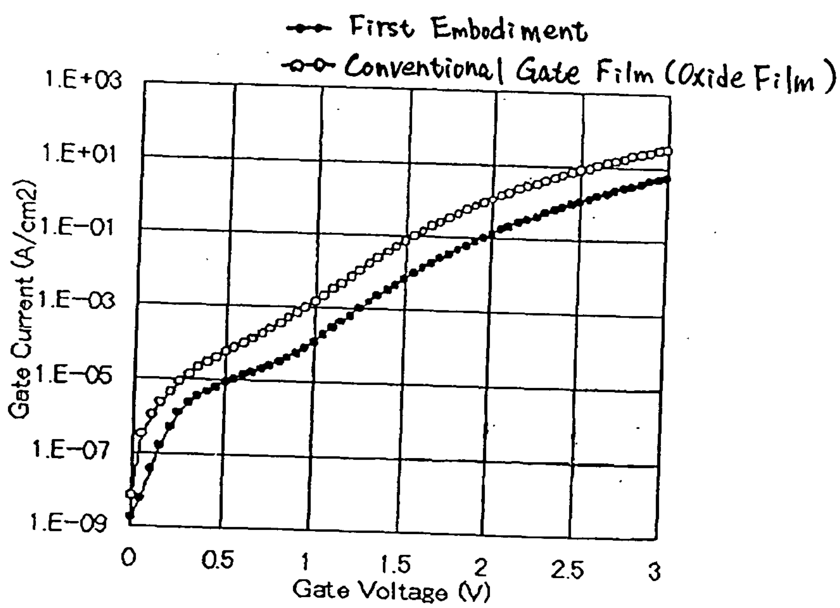

First Embodiment
Conventional Gate Film (Oxide Film)
1.E+03
1.E+01
1.E-01
1.E-03
1.E-05
1.E-07
1.E-09
Gate Current (A/cm2)
0
0.5
1
1.5
2
2.5
3
Gate Voltage (V)

Fig. 5

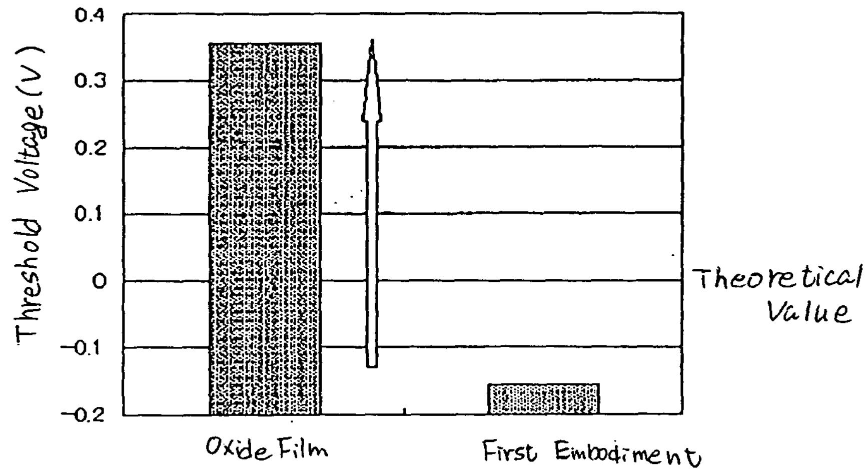

Threshold Voltage (V)
0.4
0.3
0.2
0.1
0
−0.1
−0.2
Theoretical Value
Oxide Film
First Embodiment

Fig. 6

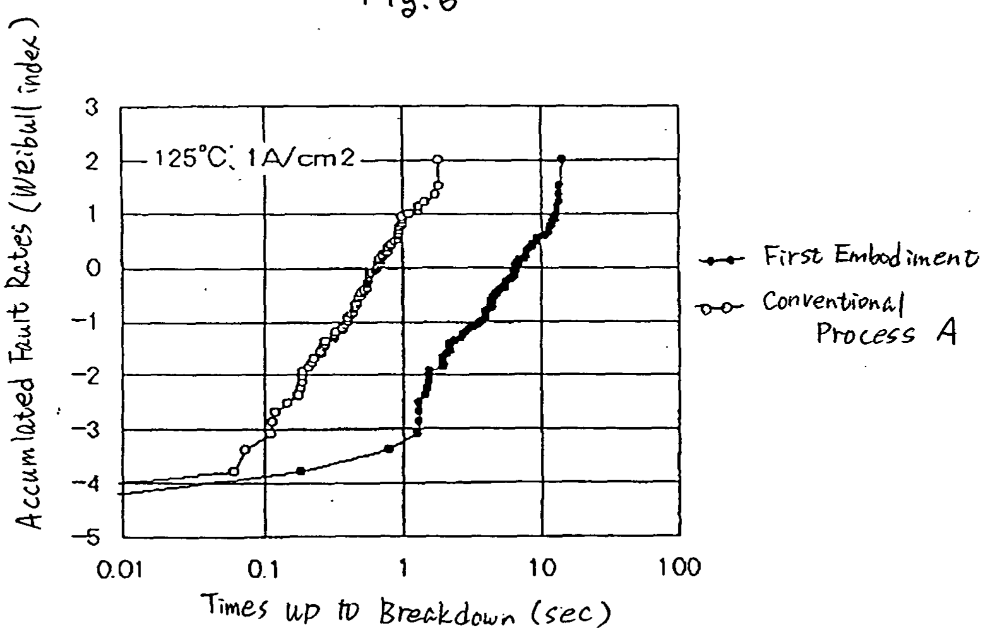

Accumulated Fault Rates (Weibull index)
3
2
1
0
−1
−2
−3
−4
−5
125°C, 1A/cm2
0.01
0.1
1
10
100
Times up to Breakdown (sec)
First Embodiment
Conventional Process A

Fig. 7

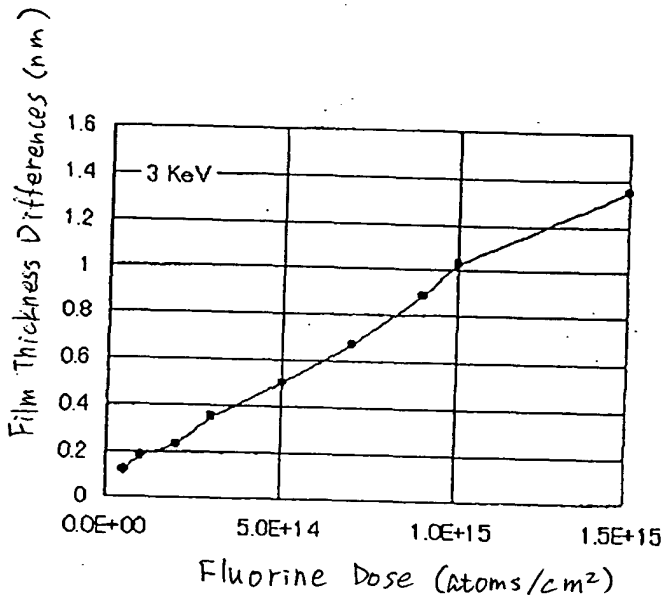

Film Thickness Differences (nm)
1.6
1.4
3 KeV
1.2
1
0.8
0.6
0.4
0.2
0
0.0E+00
5.0E+14
1.0E+15
1.5E+15
Fluorine Dose (atoms/cm²)

Fig. 8

Fig.9a

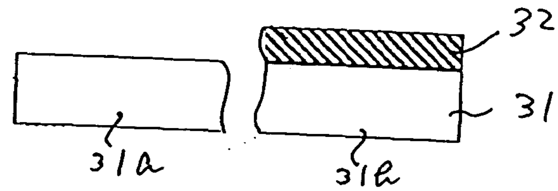


Fig.9b

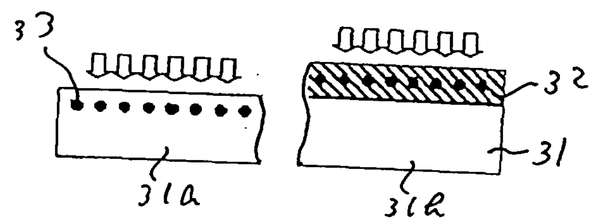


Fig.9c

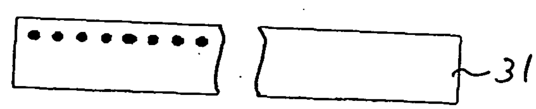


Fig.9d

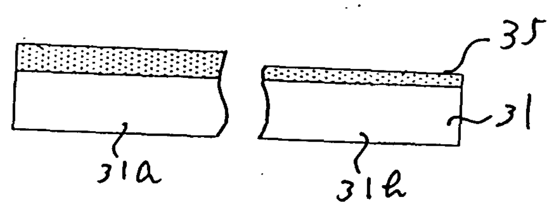


Fig.9e

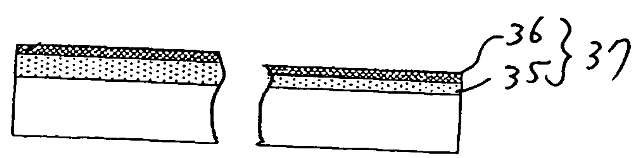


Fig. 10a

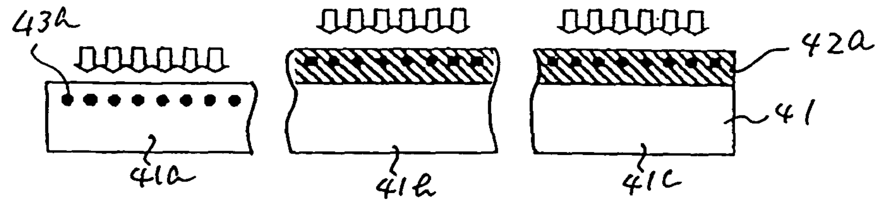


Fig. 10b

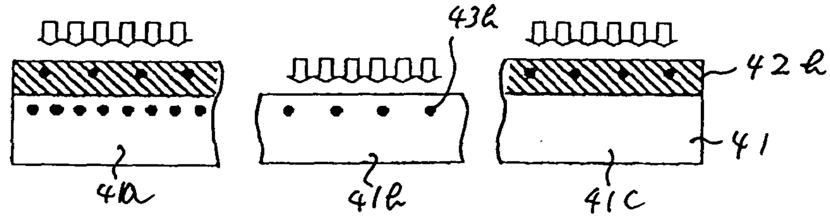


Fig. 10c

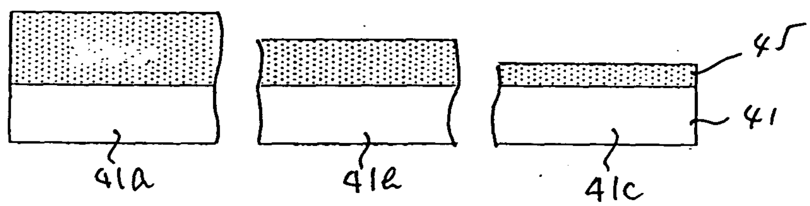


Fig. 10d

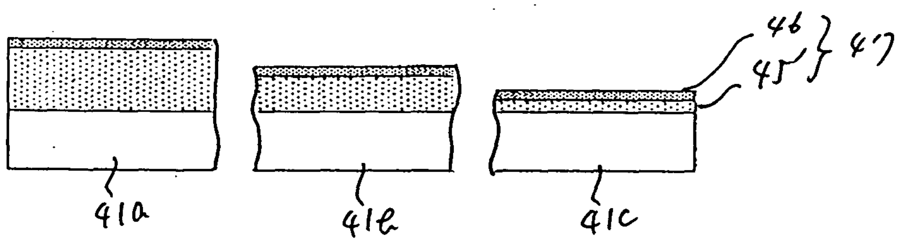


Fig. 11a

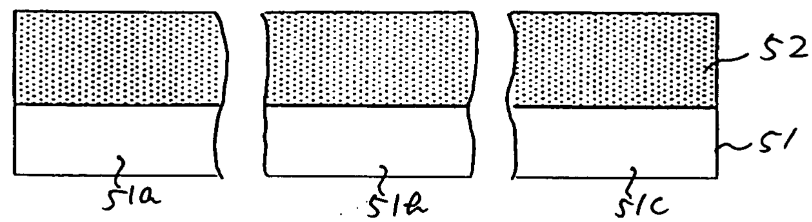


Fig. 11b

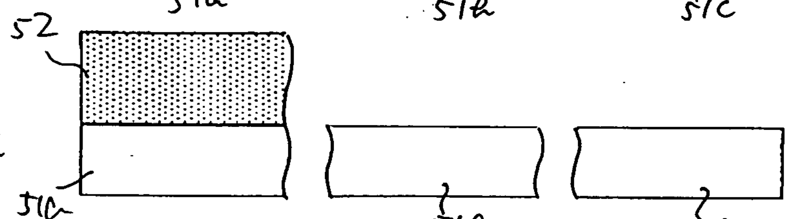


Fig. 11c

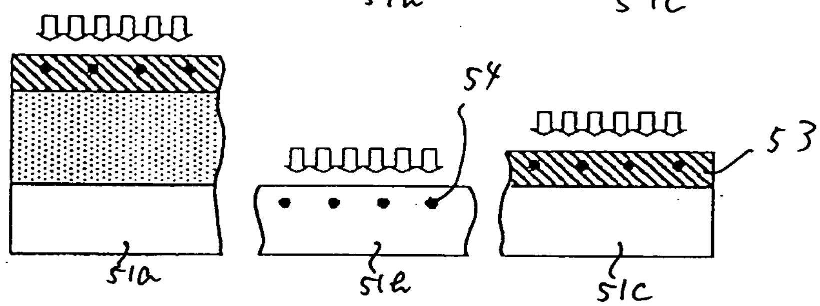


Fig. 11d

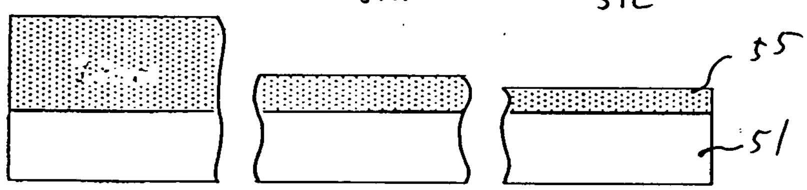
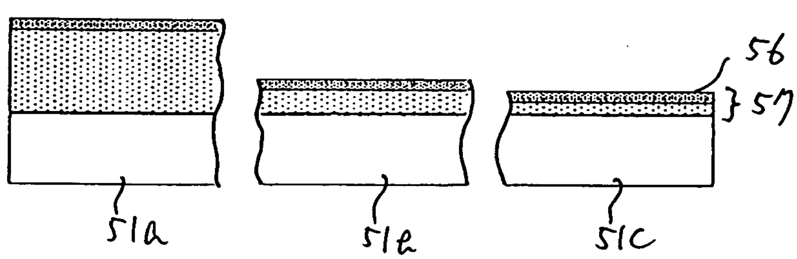


Fig. 11e



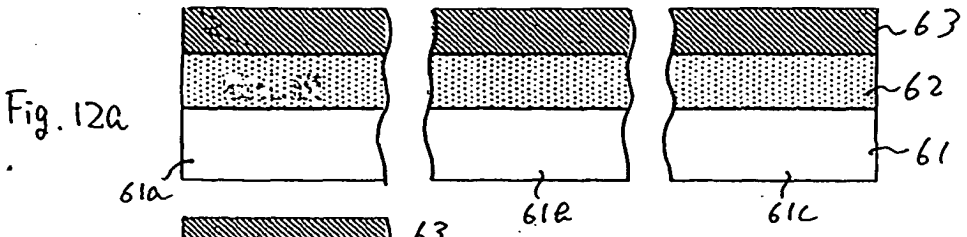


Fig. 12a

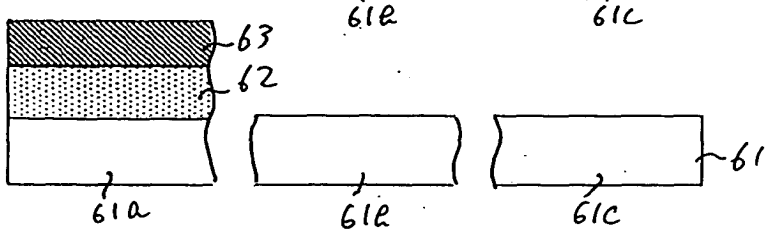


Fig. 12b

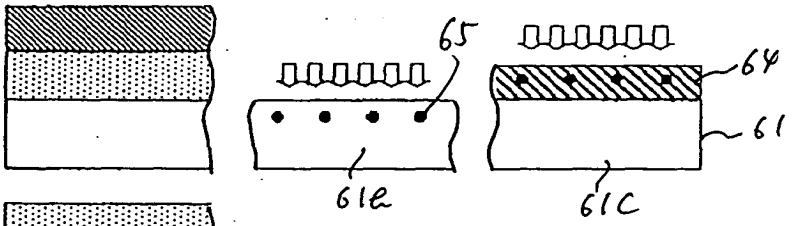


Fig. 12c

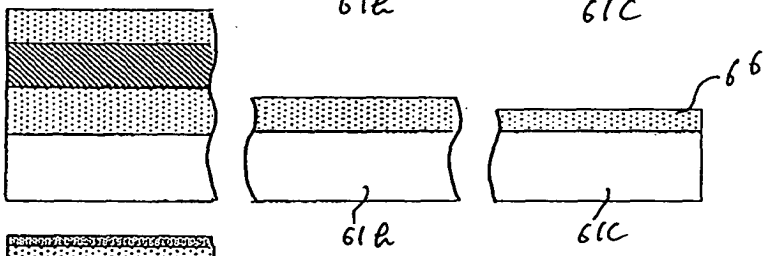


Fig. 12d

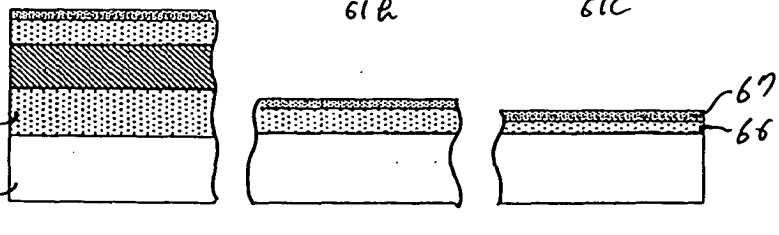


Fig. 12e

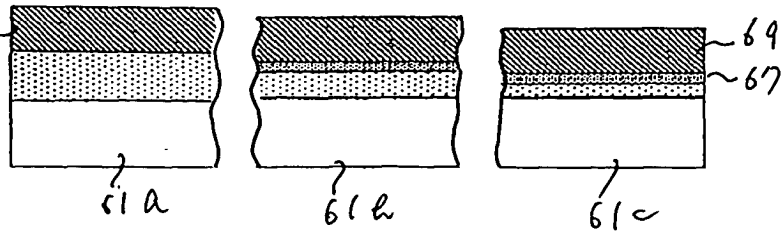


Fig. 12f